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ENGINEERING REPORT
HAZARDOUS WASTE CHARACTERISTICS
FILTER PRESS SLUDGE

for

MacDermid Inc.
Waterbury, Connecticut

S.P. Naughton
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IPC Order # 1255
25 January 1982

ipc Industrial Pollution Control, Inc.

39 Riverside Avenue Westport, Connecticut 06880

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I. INTRODUCTION AND OBJECTIVE

MacDermid Inc. manufactures plating chemicals on a batch basis. They also accept spent etching solutions for reclamation of valuable constituents.

In their Part A application for an EPA Interim Status Hazardous Waste Permit, the facility elected to declare the sludge from their wastewater treatment plant as hazardous. No analyses were performed on the sludge prior to submittal of the Part A application.

The objective of this study is to determine whether the sludge generated at this facility exhibits hazardous waste characteristics, as defined in Title 40 CFR Part 261, Subpart C of the Hazardous Waste Regulations.

As outlined in 40 CFR Subpart C, the criteria for identifying a waste as hazardous is dependent on four characteristics; (a) Ignitability, (b) Corrosivity, (c) Reactivity, (d) EP Toxicity. This study was directed towards an investigation of Reactivity and EP Toxicity only. Based on discussions with MacDermid personnel, and an engineering evaluation of their manufacturing processes and the raw materials utilized, the characteristics of Corrosivity and Ignitability were judged not applicable.

II. CONCLUSIONS

The results of the Reactivity and EP Toxicity tests on the five sludge samples tested were negative. Therefore, based on the data developed in this study, the sludge generated at MacDermid's wastewater treatment plant does not exhibit any of the four hazardous waste characteristics listed in Subpart C.

In view of these results, it is recommended that MacDermid Inc. contact the CT DEP to be reclassified as a non-hazardous waste generator, and subsequent to CT DEP approval, obtain an exemption from the Hazardous Waste Management System.

(Note: Effective February 1, 1982 the CT DEP will receive interim authorization to administer Phase I of the Federal Hazardous Waste Program.)

III. DISCUSSION

A. Sample Collection

Preliminary screening was performed on a composite of four dewatered sludge samples collected 2 September 1981 (hereinafter referred to as Sample 5). The results of the Reactivity tests were negative, indicating the absence of hydrogen sulfide evolution. The results of the EPA Toxicity test were negative, detected metals were well below the established allowable levels.

Subsequent to the preliminary screening, a broader series of tests was designed to establish a more representative data base.

As discussed in the EPA document "Test Methods for Evaluating Solid Wastes", May, 1980, sampling programs are designed according to the uniformity of the processes generating the waste and the homogeneity of the contaminant distribution within the waste. Since the facility uses batch processes to make a variety of similar products, and generates a single phase liquid waste, the sludge falls into Type II category "non-uniformly homogeneous". In Type II waste, while any given unit quantity of the waste would be homogeneous, the nature of the process generating the waste is such that the overall composition may change with time.

Mr. Giroux of the CT DEP Hazardous Waste Section was con-

tacted for his recommendation on the number of sludge samples which should be tested. Since the waste is non-uniform, Mr. Giroux recommended that a total of four sample composites, covering a six month period, be collected.

As discussed above, the facility generates its sludge on a batch basis. This material is collected and transferred to sealed drums, dated, and labeled with the appropriate lot number to reflect the processes in operation at the time of collection.

Four 300 g. composite samples were collected by MacDermid personnel in plastic pint containers and shipped to IPC's lab. Three of the composites collected covered a six month period, from May 1981 to November 1981, and the fourth composite was collected from an on-site storage pile.

The samples used in this study were:

Sample 1	May/June/July	Drums (1981)
Sample 2	Aug./Sept.	Drums (1981)
Sample 3	Oct./Nov.	Drums (1981)
Sample 4	outside storage	(1980-1981)
Sample 5	Preliminary Screening (collected 2 Sept., 1981)	

B. Reactivity Tests

Of the eight properties listed under Section 261.23 "Characteristics of Reactivity", only properties (4) and (5) were judged relevant to the sludge generated at MacDermid's treatment plant.

The remaining characteristics are intended to identify wastes which, because of their extreme instability and tendency to react violently, are considered reactive wastes by reason of explositivity. These characteristics were judged not applicable to the sludge tested.

Therefore, the reactive properties relevant to this study are:

- (4) - "When mixed with water, the solid waste generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment."
- (5) - "The solid waste is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment."

Since no specific test procedure is given in the Hazardous Waste Regulations, IPC developed a qualitative test to determine whether hydrogen sulfide gas will be evolved under the pH conditions specified (see attached Exhibit III for procedure).

As outlined in the 15th edition of Standard Methods, confirmation of the presence of H_2S is accomplished by exposure of the suspect gases to lead acetate indicator paper. Upon contact with H_2S , the indicator paper becomes

blackened by formation of lead sulfide.

The IPC test procedure involved adjusting the pH of the sample solutions to values ranging from pH 1.5 to 12.5 in closed flasks, and suspending a strip of lead acetate paper in each flask. Generation of hydrogen sulfide would have blackened the white indicator paper. On all samples tested the paper retained its white color, indicating that no hydrogen sulfide was generated. (See attached Exhibit II for test results.)

In addition to the testing described above, a composite sample, prepared in our lab from Samples 1-4, was subjected to a more rigorous evaluation (see Exhibit III for procedure). The composite solution was acidified to pH 1.3 by the addition of a 1:1 H_2SO_4 solution, and allowed to stand 24 hours. At the end of the 24 hour period, the indicator status was observed and found to be negative.

Subsequent to the qualitative evaluations, we contacted the U.S. EPA Office of Solid Waste, Waste Characterization Branch, Washington, D.C. to determine if additional quantitative testing would be required. After discussions with EPA staff chemist, Jim Poppiti, we were informed that the negative results obtained in the qualitative tests were sufficient to discount the waste as potentially reactive in regard to items (4) and (5).

C. EP Toxicity Test

The five sludge samples previously described were extracted according to the procedure outlined in Section 40 CFR 261.24 and "Appendix II - EP Toxicity Test Procedure".

The liquid extracts resulting from the EP Toxicity test procedure were transferred to 8 oz. containers, preserved with nitric acid, and were hand delivered to the Baron Consulting Company, Orange, CT for analysis.

The extracts were analyzed for the eight metals listed in Section 261.24, Table 1, of the 19 May 1980 Federal Register. The metals were analyzed by Atomic Absorption Spectrophotometry. Equipment used was a Perkin Elmer AA model 503 with deuterium arc background correction.

Analysis was not performed for the remaining organic contaminants listed in Table 1 because they are known to be absent from the raw materials and processes used at this facility.

Analytical results are presented in Exhibit I.

Of the eight metals analyzed for, only cadmium and chromium were present in detectable levels in the extract. The concentration of cadmium did not exceed 0.04 mg/l in any of the samples tested. This concentration is roughly 1/25 of the maximum allowable level. The concentration of chromium did not exceed 0.37 mg/l. This

concentration is roughly 1/13 of the maximum allowable level.

Therefore, based on this series of tests, the sludge generated at this facility does not exhibit the characteristics of EF Toxicity.

APPENDIX I: DATA PRESENTATION

EXHIBIT I

EP TOXICITY TESTS
ANALYTICAL RESULTS
(All figures in mg/l)

<u>METAL</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>Max. Conc. Allowable</u>
Pb	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	5.0
Cd	0.04	0.02	0.04	0.03	0.03	1.0
Ag	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	5.0
Cr	0.19	0.24	0.24	< 0.05	0.37	5.0
As	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	5.0
Ba	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	100.0
Se	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	1.0
Hg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.2

SAMPLE 1	MAY/JUNE/JULY	DRUMS (1981)
SAMPLE 2	AUG./SEPT.	DRUMS (1981)
SAMPLE 3	OCT./NOV.	DRUMS (1981)
SAMPLE 4	OUTSIDE STORAGE	(1980-1981)
	PILE	
SAMPLE 5	GENERATED 2 SEPT. 1981	

EXHIBIT II

REACTIVITY TESTS
QUALITATIVE RESULTS

<u>pH</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
1.5-2.0	neg.	neg.	neg.	neg.	neg.
2.0-3.0	neg.	neg.	neg.	neg.	neg.
3.0-4.0	neg.	neg.	neg.	neg.	neg.
4.0-5.0	neg.	neg.	neg.	neg.	neg.
5.0-6.0	neg.	neg.	neg.	neg.	neg.
6.0-7.0	neg.	neg.	neg.	neg.	neg.
7.0-8.0	neg.	neg.	neg.	neg.	neg.
8.0-9.0	neg.	neg.	neg.	neg.	neg.
9.0-10.0	neg.	neg.	neg.	neg.	neg.
10.0-11.0	neg.	neg.	neg.	neg.	neg.
11.0-12.0	neg.	neg.	neg.	neg.	neg.
12.0-12.5	neg.	neg.	neg.	neg.	neg.

SAMPLE 1	MAY/JUNE/JULY	DRUMS (1981)
SAMPLE 2	AUG./SEPT.	DRUMS (1981)
SAMPLE 3	OCT./NOV.	DRUMS (1981)
SAMPLE 4	OUTSIDE STORAGE PILE	(1980-1981)
SAMPLE 5	GENERATED 2 SEPT. 1981	

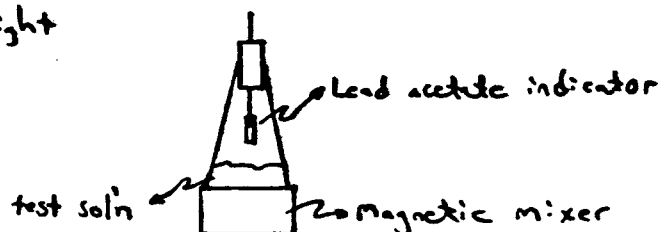
EXHIBIT III

REACTIVITY TESTING PROCEDURE

- Collect 25 g sample in a 500 ml beaker
- Add 100 ml distilled water
- Mix at high speed for 5 minutes
- Transfer solution to prepared apparatus (see diagram below)
- Adjust solution pH to desired value⁽¹⁾
- Mix gently for 5 minutes at each pH interval
- Note indicator status
- Repeat throughout entire pH range 1.5-12.5

(1) pH adjustments with NaOH at 40 g/l and H₂SO₄ 1:1

500 ml flask
-sealed air tight



Additional Test:

- Collect 10g aliquots from samples 1-4 (composite = 40 g)
- Add 100 ml distilled water
- Mix at high speed for 5 minutes
- Transfer solution to prepared apparatus
- Add 50 ml H₂SO₄ (1:1) (pH = 1.3)
- Mix slowly 8 minutes
- Let stand 24 hours
- Note indicator status

APPENDIX II: ANALYTICAL RESULTS BARON'S CONSULTING

BARON CONSULTING CO.

Harry Agahigian, Ph. D., Director

analytical services

P.O. BOX 663, ORANGE CT. 06477

December 23, 1981

To: Mr. B. Murry
Industrial Pollution Control
45 Riverside Avenue
Westport, Ct. 06880

From: Robert O. Blake, Jr.

Re: Elemental Analysis Sample series 1254
BC# 32345

	1	2	3	4
rb	ND/.02	ND/.02	ND/.02	ND/.02
Cd	.04	.02	.04	.03
Ag	ND/.01	ND/.01	ND/.01	ND/.01
Cr	.19	.24	.24	ND/.05
As	ND/.01	ND/.01	ND/.01	ND/.01
Ba	ND/.05	ND/.05	ND/.05	ND/.05
Se	ND/.01	ND/.01	ND/.01	ND/.01
Hg	ND/.001	ND/.001	ND/.001	ND/.001

All values are expressed in mg/l.

Please review the data & contact us if you wish more information.

Robert O. Blake Jr

ROB/rsb

Robert O. Blake, Jr.
Baron Consulting Co.

BARON CONSULTING CO.

Harry Agahigian, Ph. D. Director

analytical services

P.O. BOX 663, ORANGE CT. 06477

October 2, 1981

To: Mr. B. Murry
Industrial Pollution Control
45 Riverside Avenue
Westport, Ct. 06880

From: Robert O. Blake, Jr.

Re: Analysis of sample 1248-1 (SAMPLE 5)
BC# 31574

Cd	.03
Ag	ND/.01
Pb	ND/.02
Hg	ND/.001
As	ND/.01
Ba	ND/.05
Cr	.37
Se	ND/.01

All values are expressed in mg/l.

Please review the data & contact us if you wish more information.

Robert O. Blake Jr.

ROB/rsb

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Baron Consulting Co.